REEVALUATION OF CONTROL MEASURES IN THE RUBBER BAND MANUFACTURING AREA

PLYMOUTH RUBBER COMPANY
Canton, Massachusetts

NIOSH PERSONNEL

John M. Dement
Patrick J. Shuler
Paul F. Alvarado

STATE OCCUPATIONAL HEALTH PERSONNEL

Robert Cashens
Ronald Ratney

REPORT PREPARED BY:

John M. Dement
Patrick J. Shuler
Paul F. Alvarado

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7. Author(s)
Dement, J. M., P. J. Shuler, and P. F. Alvarado

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Exposure to talc (14807966) was evaluated at the Plymouth Rubber Company (SIC-3069) in Canton, Massachusetts, on January 23, 1973. Four personal air samples were collected from the rubber band manufacturing area for comparison with samples collected in a former survey. Concentrations were 1.9, 2.2, 3.0, and 4.2 milligrams per cubic meter (mg/cu m) for the packer, improved extruder unit, old extruder unit, and vacuumer, respectively. Exposure was reduced to half of the earlier measurements at the improved extruder unit. By estimation, total dust concentration decreased from previous values by a factor of 2. The present OSHA standards for nonfibrous talc is 20 million particles per cubic foot. Silica was reduced from 3 to 0.6 percent. The allowable respirable dust OSHA standard of 2.5mg/cu m was exceeded in two samples. The authors conclude that many of the ventilation and housekeeping improvements since the initial survey have produced successful results, however, additional improvements were recommended in the rod stripping and old extruding unit areas.

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PERSONS MAKING TRIP	:	John M. Dement, EIB Patrick J. Shuler, EIB Paul F. Alvarado, Region I
PERSONS CONTACTED	:	Mr. Bernard Wax, Vice President Mr. Charles Rowe, Special Project Manager Mr. W. M. Ferrciva, Division Manager Mr. Ron Darling, Union President, United Rubber Workers, Local 573 Mr. Robert Cashens, Assistant Engineer, Massachusetts Department of Labor and Industries Mr. Ronald Ratney, Massachusetts Departme of Labor and Industries
PURPOSE OF TRIP	:	To evaluate control measures in the rubber band manufacturing area.

INTRODUCTION

The Division of Field Studies and Clinical Investigations conducted an industrial hygiene survey of the Plymouth Rubber Company, Canton, Massachusetts, in April-May, 1972. The reader is referred to the report on this survey to obtain background information concerning the facility, sampling methods, and results.

The industrial hygiene survey revealed that talc and free silica concentrations in the rubber band manufacturing area were well in excess of present OSHA standards; therefore, several recommendations were made in the report for reducing concentrations from these operations. The plant management has acted upon these recommendations and has made numerous ventilation and work practice improvements to alleviate the talc dust problem. Upon request by the company, the Environmental Investigations Branch, Division of Field Studies and Clinical Investigations and Region I, NIOSH, made a one day visit on January 23, 1973 for purposes of evaluating the effectiveness of these improvements.

A walk-through survey of the plant was conducted and four personal respirable samples were taken. Results of the samples are discussed on page 4 of this report.

IMPROVEMENTS WHICH HAVE BEEN MADE

The following are improvements which have been initiated by the company:

1. The large uncovered gears noted in the previous report (page 2) have been well guarded.
2. Rubber sheets from the mixing area are now dusted with only a minimal amount of talc and anti-stick plastic sheets are used to separate the rubber sheets. This eliminates many dusty material transfer operations.
3. The method for application of talc at the extruder stations has been redesigned. Much less talc is being applied and the exhaust hood has been moved closer to enlcose the spray operation.
4. Additional exhaust ventilation has been added at the metal rod stripping areas and workers in these areas are required to wear Bureau of Mines approved respirators (Welsh Model 701).
5. A "Spencer" vacuum cleaner has been purchased for floor and machine cleaning. Broom cleaning and use of compressed air have been discontinued.

PLANNED IMPROVEMENTS & EXPERIMENTAL WORK

As discussed in the previous report, one continuous extruding and curing machine is presently in operation. Another such machine is on order and it is anticipated that these two machines will account for 80 percent of the company's rubber band production. These machines are advantageous from a dust standpoint in that talc is not applied to the outside of the extruded tubes and the tubes are continuously cured by passing them through molten potassium nitrate. This "continuous cure method" eliminates the presently used dusty operation of removing curing rods by hand.

An experimental approach to reducing dust at the extruding stations without improvements has been to use a liquid anti-stick lubricant compound instead of talc dust on the extruded rubber tubes. This wet method produces no airborne dust. The major disadvantage is that the liquid is not as good a lubricant as talc, so the tubes can not be racked as closely together. This has the effect of reducing the capacity of the steam antoclave for curing the rubber tubes. Company management anticipates that addition of the second continuous extruding and curing machine will reduce rubber band production by the old method such that this loss in capacity will be tolerable.

RESULTS AND DISCUSSION OF SAMPLING

Four personal mass respirable samples were taken in the rubber band manufacturing area for comparison with the airborne talc concentrations found in the original survey. The samples were collected on Mine Safety Appliance, polyvinyl chloride filters (5.0μ pore size) using a cyclone pre-sampler at a flow of 1.7 liters/min. The gravimetric results are presented in Table 1.

Although only four (4) samples were taken, the changes made in the operations are reflected by the respirable airborne dust at the extruding station being only about half as high as previously reported (2.2 mg/m^3 versus 4.8 mg/m^3). Assuming that the respirable fraction makes up 10-20% of the total airborne fraction (approximate values from the previous survey), it can be speculated that the concentration of total dust has probably also dropped by a factor of 2 or more.

There is an indication that the new hooding at the extruding stations is better since the sample taken there is 2 mg/m^3 lower than one taken on an extruder operator at a unit with the original ventilation design (see Table 1). This latter sample (4.2 mg/m^3) is nearly as high as the average of the respirable mass samples taken at the extruding stations during the original survey (4.8 mg/m^3).

Examination of the talc used in this facility by optical and electron microscopy has shown the material to be relatively low in fiber content although fiber counts by phase contrast microscopy during the original survey were found to be excessive. Due to the tremendous reduction in total dust levels, excessive fiber exposures should not be a problem; therefore, the OSHA standard for non-fibrous talc is applicable in this situation. The present OSHA standard for non-fibrous talc is 20 mppcf if it contains less than 1 percent free silica. One of the four samples taken during this visit was analyzed for free silica using both x-ray diffraction and the Talvitie method and found only 0.6 percent as opposed to the content of two-three percent found on the previous survey. The previous survey had approximately 35 free silica determinations made; therefore, it is felt that a content of two-three percent is a more accurate figure. With this free silica content, the best OSHA standard for comparison purposes would be that for free silica in a respirable dust sample as computed by the following formula (Federal Register, October 18, 1972, 29CFR1910.93):

$$\text{Standard} \quad (\text{mg/m}^3) = \frac{10}{\% \ SiO_2 + 2}$$

Using two percent as the free silica content, allowable respirable dust concentrations should be at least less than 2.5 mg/m^3. This was only exceeded substantially by the one personal sample taken on the extruder operator at a unit with unimproved ventilation.

Total dust samples were not taken; therefore, no comparison can be made with total dust standards for free silica.

CONCLUSIONS AND RECOMMENDATIONS

Based on information supplied by the management, observations made on the plant visit, and the limited sample results, the following conclusions and recommendations are made:

1. The levels of airborne talc in the rubber band manufacturing area are much lower because of the improved housekeeping practices and ventilation. With the installation of the second continuous cure machine, production in the old area will decrease and further reduce any talc dust problem.

2. There is still room for improvement at the old extruding stations. Most of the units are equipped with the improved hooding; however, those that do not should have this alteration in ventilation made. Use of the liquid anti-stick solution should be further investigated and instituted as soon as possible.

3. Dust exposure at the rod stripping operation still appears to be a problem. The major problem with the ventilation in the stripping area is that the point of exhaust is too close to the floor. One possible solution would be to attach a vertical flanged slotted hood that would be about seven feet high to the present ventilation ducts in the stripping area. Also in this area, the respirators worn by the workers did not always appear to fit correctly. They should be periodically checked to insure that the mask fits snugly all the way around.

TABLE 1

PERSONAL MASS RESPIRABLE SAMPLE RESULTS

PLYMOUTH RUBBER COMPANY
Canton, Massachusetts

January 23, 1973

JOB	*SAMPLE #*	*FILTER TYPE*	*CONCENTRATION* mg/m^3
Packer *(in same room as band manufacture)*	158	MSA	1.9
Laborer *(cleaning with vacuum unit)*	209	MSA	3.0
Extruder *(unit with old type ventilation)*	157	MSA	4.2
Extruder *(unit with improved ventilation)*	208	MSA	2.2